Monitoring the Effects of Tamarisk Leaf Beetles on Riparian Birds

Project Update

FY12

Project Description

Riparian habitat comprises very little of the landscape in the western U.S.; however, many wildlife species depend on this habitat (Bureau of Land Management 1998). The Bureau of Land Management (BLM) estimated that the number of birds that depend upon riparian habitat in the western U.S. is two to ten times higher than all other available habitats (Bureau of Land Management 1998). Riparian habitat has been severely impacted in the western U.S. due to exploitation of the resources present (i.e., water, lumber, forage) by humans (Patten 1998). Channelization, dam building and other attempts to control water flow regimes have also had a major impact on riparian areas in the western U.S. As a result, human activities have caused a decline in many riparian dependent wildlife species. The introduction of exotic tree and shrub species has also caused dramatic changes to riparian areas in the western U.S. Tamarisk (Tamarix sp), a plant species intentionally introduced into western riparian areas to control erosion, has spread rapidly and displaced native species (Glenn and Nagler 2005). No insect species native to the U. S. forages on tamarisk. Because invasion of Tamarisk has negatively impacted stream flow, stream sedimentation, soil salinity, fire regimes, livestock forage, and regeneration of native vegetation, various methods have been employed to remove Tamarisk from riparian areas (Tamarisk Coalition, unpublished). These methods include mechanical removal, chemical treatment and, more recently, biological control. In 2001 the non-native Tamarisk Leaf Beetle (*Diorhabda sp*) was released in the Upper Colorado River Basin in an effort to control Tamarisk. The beetle eats only Tamarisk leaves throughout its life cycle. Biologists have studied the relationship between birds and invasion of Tamarisk in riparian ecosystems of the Lower Colorado River Basin for several decades (e.g., Anderson et al. 1977). In the Lower Colorado River Basin, use or avoidance of Tamarisk by birds varied among avian species, river systems, and resident status (Hunter et al. 1988, Ellis 1995, Sogge et al. 2008, van Riper et al. 2008). Avian species abundance in some areas peaked at intermediate levels of Tamarisk cover (van Riper et al. 2008). In contrast to the lower basin, little research has occurred on bird-Tamarisk relationships in the Upper Colorado River Basin. Furthermore, no published studies have investigated the effects of biological control of Tamarisk on birds. Rocky Mountain Bird Observatory (RMBO), in cooperation with The Tamarisk Coalition, initiated a study in 2008 to evaluate the effects on birds of Tamarisk defoliation by Tamarisk Leaf Beetles in riparian habitat. Ouray National Wildlife Refuge (NWR) was added in 2009. The primary objective is to estimate densities of bird species and bird species richness as a function of Tamarisk cover and defoliation of Tamarisk.

Objectives

Estimate densities of bird species and bird species richness as a function of Tamarisk cover and defoliation of Tamarisk.

Methods and Design

Birds are surveyed from points using methods that allow for estimating detection probability through the principles of Distance Sampling. Distance Sampling theory estimates detection probability as a function of the distances between the observer and the birds detected (Buckland et al. 1993). The detection probability is used to adjust the count of birds to account for birds that were present but undetected. All transects are surveyed in the morning between ½-hour before sunrise and 11 AM. Points are located at 250-m intervals along each transect. Each point is monitored for 5 minutes. All bird detections are recorded on standardized forms. Flyovers (birds flying over, but not using the immediate surrounding landscape) are recorded but not used in analyses of density. For each bird detected, species, sex, detection type (e.g., call, song, drumming), and horizontal distance from the observation point is recorded. Whenever possible, distances are measured using laser rangefinders. When this is not possible, the distance is estimated using rangefinders to some nearby object. Atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind speed) are recorded, as are start and end times for each transect. Distances between points is measured using hand-held Global Positioning System (GPS) units. At each point, UTM coordinates (North America Datum 1983) are recorded. Primary habitat type, the habitat's structural stage, and the types, relative abundance, percent coverage, and mean height of trees, shrubs, and groundcover are recorded. If there is a distinct subcanopy present, the types of sub-canopy trees are also recorded. All this data is recorded prior to beginning each point count. After each point, "sweep" nets are used for beetles on tamarisk present. If beetles are present, beetles are counted and recorded. Finally, the percent defoliation of Tamarisk is recorded.

The study includes the portion of the Upper Colorado River Basin that lies in Utah and Colorado and consists of riparian vegetation along the Green River and its major tributaries. Using a digital map indicating the range of the Tamarisk Beetle in 2008, sampling locations were selected in equal proportion within and outside the range of the beetle. The sampling unit was defined as a 5-km2 block. ArcMap and Google Earth software was used, and a digital map of vegetation cover from the Southwest Regional Gap Analysis Project (SWREGAP; Lowry et al. 2005) to characterize the study area. Landcover types used were Invasive Southwest Riparian Woodland and Shrubland, and Rocky Mountain Lower Montane Riparian Woodland and Shrubland (Ecological System codes D04 and S093, respectively; Lowry et al. 2005). Twelve transects were established that met the minimum criteria (location near river, riparian vegetation, sufficient spacing between points, minimum of 8 points, accessible, etc). Due to flooding and lack of funding, all transects, survey periods, or points have not been surveyed consistently.

Data Analysis

Application of distance theory requires that three critical assumptions be met: 1) all birds at and near the sampling location [distance = 0] are detected; 2) distances of birds are measured

accurately; and 3) birds do not move in response to the observer's presence. This sampling protocol meets the assumptions of Distance Sampling theory reasonably well (Hanni et al. 2009). Program Distance 6.0 (Thomas et al. 2010) is used to estimate the detection probability and density of each bird species. The following functions are fit to the distribution of distances for each species: Half normal key function with cosine series expansion, Uniform function with cosine series expansion, Hazard rate key function with cosine series expansion, and Hazard rate key function with simple polynomial series expansion (Buckland et al. 2001). The required sample size for estimating a detection function is at least 60-80 independent detections. Aaike's Information Criterion (AIC) is used to correct for small sample size (AICc) and model selection theory to select the most parsimonious detection function for each species (Burnham and Anderson 2002). Because the focus of this study is to examine the effects of Tamarisk Leaf Beetle, density is estimated only from data points that had some Tamarisk present. The data is then post-stratified according to whether or not we observed Tamarisk defoliation. Because detection probability is anticipated to be greater (due to better visibility) at points where Tamarisk had been defoliated, detection probability is modeled separately for points with or without defoliation.

Data Management

RMBO enters the data into an Excel spreadsheet which is provided to Ouray NWR and to any other interested parties (such as Utah Division of Wildlife Resources).

Partners

Ouray NWR
Rocky Mountain Bird Observatory
NPS, Dinosaur National Monument
Bureau of Land Management

Sources of Support

Dinosaur National Monument has funded the monitoring of the two transects within the Monument since 2006. I & M funded the other transects monitored in 2012.

Current Status

As for the Refuge, data has served as baseline data of species presence, which the Refuge was lacking for riparian birds. In 2012, 81 species were detected with a total of 102 species detected from 2009 – 2012. A report is due in Feb., 2013 which will model and analyze all the data thus far from the entire project.

The two transects on the Yampa River in Dinosaur NM have been surveyed 2006-2012 but will no longer be funded after 2012.

Three transects are located on the BLM and were surveyed in 2009, 2010, and 2012. One transect is located on State and BLM land and has only been surveyed in 2009. Three transects

are on tribal and private lands; one transect was surveyed in both 2009 and 2010, one transect surveyed in 2009 only and one in 2010 only. The tribe did not allow access in 2012.

The three transects on Ouray NWR were surveyed once in 2009, three times in 2010, and once in 2011.

In 2012, a total of eight transects were monitored: two on Dinosaur NM, three on BLM and three on Ouray NWR. All points were accessible on Ouray NWR in 2012 and were monitored 5 times. The BLM points were monitored 4 times.

Beetle defoliation was pronounced in 2010, increased slightly in 2011 (which was surprising due to the extreme flooding conditions), and completely defoliated the entire Refuge in 2012 by Aug 1. Expectations for the future are to see defoliation each year throughout the Green River area with cyclical degrees of slight to severe defoliation.

In addition, all Russian olive has been removed from the riparian area within the Dinosaur NM and BLM. Russian olive removal within Ouray NWR has become a priority but it will take several years to completely remove all of it. Thus, the riparian structure has and will continue to drastically change.

Challenges

The biggest challenge this project faces is consistent and adequate funding. Initially the Tamarisk Coalition (Grand Junction, CO) funded the project in its entirety (except those transects within Dinosaur NM which were already funded) from 2008 through 2010. In 2011, only those transects within Dinosaur NM and Ouray NWR were monitored, funded by each respective agency. Ouray NWR considers this monitoring to highly valuable as the riparian habitat within Ouray NWR and the Green River system has and will be highly altered.

The second challenge is access to tribal transects. Past years, access has been allowed. The tribe now wants to charge a fee which will be planned into future budgets.

The final challenge is not controllable. High river flows can prevent access into some transects and points. This is most common on Ouray NWR. In 2011, the transects were only accessible once each and many of the points within the transect could not be accessed.

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